REMARKS/ARGUMENTS

Brief Summary of Status

Claims 1-69 are pending in the application.

Claims 1, 2, 4, 7, 8, 15-20, 28, 31-36, 40, 42-47, 50, 51, 58-61, 63, 64, 68, and 69 are rejected.

Claims 3, 5, 6, 9-14, 21-27, 29, 30, 37-39, 41, 48, 49, 52-57, 62, and 65-67 objected to.

1. In the above-referenced office action, the Examiner has objected to the ABSTRACT.

3. The Examiner rejected claims 1, 2, 4, 7, 8, 17-20, 28, 31, 34-36, 40, 42, 45-47, 50, 51, 60, 61, 63, and 64 under 35 U.S.C. §102(e) as being anticipated by Agazzi, Patent Application Publication US 2002/0060827 A1 (hereinafter referred to as "Agazzi").

5. The Examiner rejected claims 15, 16, 32, 33, 43, 44, 58, 59, 68, and 69 under 35 U.S.C. §103(a) as being unpatentable over Agazzi and in further view of Fulgham, et al. Patent Application Publication US 2002/0159546 A1 (hereinafter referred to as "Fulgham").

6. The Examiner has indicated that claims 3, 5, 6, 9-14, 21-27, 29, 30, 37-39, 41, 48, 49, 52-57, 62, and 65-67 are objected to as being dependent upon a rejected base claims, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Abstract

1. In the above-referenced office action, the Examiner has objected to the ABSTRACT.

The Applicant respectfully points out that such phrases as "the disclosure concerns" or even the word "disclosure" did not appear in the originally submitted ABSTRACT.

The Applicant has amended ABSTRACT the so that it does not include incomplete sentences. The word counts of each of the originally submitted ABSTRACT and the currently amended ABSTRACT are both less than 150 words. As such, the

Applicant respectfully requests that the Examiner withdraw any objection to the ABSTRACT.

35 U.S.C. §102(e)

3. The Examiner rejected claims 1, 2, 4, 7, 8, 17-20, 28, 31, 34-36, 40, 42, 45-47, 50, 51, 60, 61, 63, and 64 under 35 U.S.C. §102(e) as being anticipated by Agazzi.

The Applicant respectfully traverses.

In the above-referenced office action, the Examiner asserts:

"**Claim 1, 17, 18, 34, 45, 60,** Agazzi discloses a method of estimating and equalizing a receiving channel in which a received channel is estimated (fig. 13, 1305) with already known training signals ([0083], lines 29-30) and equalized (1300). The channel estimation block models the channel based on a look-up table that is able to repeatedly adapt to the characteristics of the channel through update functions with a decision feedback equalizer ([0092]). The look-up table coefficients can effectively function as tap coefficients in the equalizer. The use of channel estimation to remove errors induced by the channel from the signal is an obvious purpose of channel estimation to one skilled in the art." (office action, Part of Paper No./Mail Date 05042005, p. 3).

The Applicant respectfully points out that the claims should be interpreted with reference to the Applicant's specification and figures.

The Applicant respectfully directs the Examiner to various portions of the Applicant's specification and figures that describe various embodiments and aspects of "repeated adaptation" as claimed by the Applicant.

For example, the Applicant's FIG. 13 and FIG. 14 and associated written description refer to and describe the use of repeated training sequences (TSs) and the formation of a modified data packet from an incoming packet. The incoming packet includes a TS portion and data portion; the modified data packet includes the TS portion, at least one copy of the TS portion, and the data portion.

"FIG. 14 is a diagram illustrating an embodiment of data packet processing with repeated adaptation 1400 that is performed in accordance with certain aspects of the present invention. An incoming data packet 1410 is shown as having an original packet size that is composed of a TS portion and a data portion. Typically, as throughput rates of communication systems continually seeks to increase, the size of the TS continues to

decrease in length. This can be problematic, in that, there is an insufficient amount of TS information or time to converge to an accurate channel estimate or to converge at the optimal equalizer tap coefficients within an equalizer.

The present invention provides for repeating the TS multiple times, so that a modified data packet 1420 may be generated. This modified data packet 1420 may be viewed as having the same data portion of the incoming data packet 1410, yet it also has a number of TSs, shown as a TS, a repeated TS, …, and (in some embodiments) another repeated TS. These repeated TSs may be generated by storing the original TS in a buffer, and then retrieving copies of the original TS to generate the modified data packet 1420. The number of repeated TSs may be programmed to adapt to the particular application, or to the computational functionality of the channel estimation and/or channel equalization that is to be performed in a given embodiment. The data packet processing with repeated adaptation 1400 may be performed in the channel estimation and/or channel equalization that are/is performed in accordance with the present invention." (Applicant's specification, p. 30, line 16 to p. 31, line 10).

As can be seen, when processing a single packet, the Applicant describes the use of repeating the TS multiple times. Copies of the TS may be retrieved from a buffer to generate a modified data packet. In accordance with the repeated adaptation described within the Applicant's specification, it is noted that the multiple copies of the TS as well as the data portion are employed within the repeated adaptation.

As some examples within the Applicant's specification:

"The present invention repeats the repeated adaptation on the same training sequence (TS) for multiple cycles. The resulting conditions, in either the channel equalization mode or the system identification mode, are ~~is~~ used as the initial condition for the next cycle. If desired, 'a priori' information may be used to provide a more accurate initial condition; this may include offline channel modeling and/or characterization of the channel's response." (Applicant's specification, p. 4, lines 11-15).

"From one perspective, the invention is based on "repeating" the adaptation for more than one cycle on the same training sequence." (Applicant's specification, p. 4, lines 18-19).

"In this mode of operation, the repeated adaptation operation, ~~which~~ may be referred to as the cyclic adaptation within the functional block 935." (Applicant's specification, p. 26, lines 21-22).

"In a second operational mode (labeled 2), the repeated adaptation operation, which may be referred to as the cyclic adaptation within the functional block 935, is employed directly to converge the equalizer tap coefficients themselves without obtaining a channel estimate first." (Applicant's specification, p. 27, lines 4-6).

Furthermore, within some of the claims, the terminologies of "channel estimation cycles" and "channel equalizer cycles" are employed. In view of the Applicant's specification and figures, it is clear that these cycles of the repeated adaptation can be construed, at least in one possible embodiment, as corresponding to the processing (i.e., channel estimation or channel equalization) being performed on the training sequence portion, at least one copy of the training sequence portion, and the data portion within the same modified data packet in accordance with the repeated adaptation as described in the Applicant's specification and figures.

The Applicant respectfully asserts that, in order to support a rejection under 35 U.S.C. §102, the cited reference must teach and disclose each and every limitation of the Applicant's claimed subject matter.

Agazzi does not teach and disclose the use of both a training sequence portion and a data portion of a signal in performing either channel estimation or channel equalization.

"One solution to the problem of coefficient identification is to have the transmitter send *a training sequence*, which is known a priori, to the receiver. The nonlinear channel estimator 1305 can then be *trained using the known training sequence*." (Agazzi, 0083, lines 27-31, *emphasis added*).

In Agazzi, there is no teaching at all of using anything in addition to the "*training sequence*" to train the "nonlinear channel estimator 1305". Agazzi does not teach or disclose using the training sequence portion and anything else (e.g., a data portion) to train the "nonlinear channel estimator 1305". Also, there is no teaching at all of using anything more than "*a training sequence*" (e.g., anything more than "1" *training sequence*). Agazzi does not teach or disclose anywhere the use of "multiple training

sequences" or "repeated training sequences" in training the "nonlinear channel estimator 1305".

The Applicant respectfully points out that Agazzi only uses the phrase "training sequence" 3 times (2 of which are cited above, and the 3rd instance is cited below).

"In practice, a *training sequence may not be required* because the decisions 1307 of the decision feedback equalizer 1300 and the nonlinear channel estimator 1305 may still converge." (Agazzi, 0084, lines 1-4, *emphasis added*).

Agazzi teaches and discloses the use of only the "*training sequence*" to train the "nonlinear channel estimator 1305" in one instance and another instance in which a "*training sequence may not be required*".

With respect to channel equalization, the Examiner cited portion of Agazzi also does not teach and disclose using both a "*training sequence*"/"*known sequence*" and a data portion of a signal.

"FIG. 14B is an exemplary block diagram of a non-linear optical channel equalizer employing a lookup table channel estimator, according to the embodiment of the invention. In FIG. 14B an LMS algorithm may be employed in adjusting the values within the look up table 1435. The system 14B may be operated so that training of the equalizer is accomplished by processing of a signal provided from an optical channel, determining error signals and adjusting the equalizer 1401. In such a manner the equalizer may be trained to model the channel parameters. *Those skilled in the art will recognize that the equalizers may be trained by employing a known sequence.* Because such a sequence is known a priori the *difference between the response of the channel and the desired response of the channel*, i.e., the known sequence, *can be readily determined.* Such sequences may shorten the time necessary to train a nonlinear optical channel equalizer.

A nonlinear channel estimator could also be built based on the look up table approach illustrated in FIG. 4. The implementation of such a look up table version is a straight-forward adaptation of the channel characterization circuit illustrated in FIG. 4." (Agazzi, 0091 and 0092, *emphasis added*).

As described above with respect to the channel estimation of Agazzi, there is no teaching at all of using anything in addition to the "*known sequence*" to train the

"equalizer 1401". Agazzi does not teach or disclose using the known sequence portion and anything else (e.g., a data portion) to train the "equalizer 1401". Also, there is no teaching at all of using anything more than "*a known sequence*" (e.g., anything more than "1" *known sequence*). Agazzi does not teach or disclose anywhere the use of "multiple known sequences" or "repeated known sequences" in training the "equalizer 1401".

It appears clear that Agazzi discloses using EITHER a training/known sequence only (i.e., only a training/known sequence portion and no data portion) OR no training/known sequence at all (i.e., only a data portion).

The Applicant respectfully points out that Agazzi simply performs channel estimation and channel equalization in manners that are in contradistinction to the subject matter as claimed by the Applicant.

Agazzi fails at least to teach and disclose the generation of a modified data packet that includes a training sequence portion, at least one copy of the training sequence portion, and a data portion that is used in performing repeated adaptation thereon.

The Applicant respectfully asserts that Agazzi does not teach and disclose repeat adaptation as claimed by the Applicant, when viewed in light of the Applicant's specification and figures.

In addition, the Examiner asserts the following:

"Claims **2, 46,** inherit the limitations of Claims I , 45, respectively, further Agazzi discloses the channel estimator (fig. 148, 1433) repeatedly estimates the channel and uses this information to determine the coefficients of the look-up table (1435)." (office action, Part of Paper No./Mail Date 05042005, p. 4).

As described above, the Applicant respectfully points out that Agazzi does not teach and disclose performing channel estimation in accordance with the subject matter as claimed by the Applicant in claim 1 of the channel estimation block being operable to employ repeated adaptation on the training sequence portion and the data portion, the repeated adaptation of the channel estimation block being performed using a plurality of channel estimation cycles.

Agazzi does not teach and disclose using both the training sequence portion and the data portion in performing channel estimation.

In addition, the Examiner asserts the following:

"Claims **4, 28, 40, 47, 61,** Agazzi further discloses equalizer coefficient identification can be determined by the transmitter sending a *training sequence known a priori to the receiver*. The nonlinear channel estimator (fig. 13, 1305) can then be trained using the known training sequence. ([0083])." (office action, Part of Paper No./Mail Date 05042005, p. 4, emphasis added).

This Examiner cited portion of Agazzi is provided here again for ease of the reader:

"One solution to the problem of coefficient identification is to have the transmitter send *a training sequence*, which is known a priori, to the receiver. The nonlinear channel estimator 1305 can then be *trained using the known training sequence*." (Agazzi, 0083, lines 27-31, *emphasis added*).

The Applicant respectfully agrees with this Examiner cited portion of Agazzi that clearly indicates that only the "*training sequence*" is known "a priori". The Examiner's assertion provided above also provides that only the "*training sequence [is] known a priori*". There is no indication in Agazzi that any information is known "a priori" that corresponds to the characteristic of the communication channel (e.g., offline channel modeling and/or characterization of the channel's response -- as examples provided in Applicant's specification, p. 4, line 15).

According to this Examiner cited portion of Agazzi, no information corresponding to any characteristic of the communication channel is known "a priori". Agazzi does not teach and disclose that a communication receiver receives, as input, 'a priori' information that corresponds to the characteristic of the communication channel. In contradistinction, within Agazzi, only the "*training sequence [is] known a priori*".

Therefore, the Applicant respectfully asserts that although Agazzi does perform channel estimation and channel equalization, each of those approaches disclosed in Agazzi are performed significantly differently than the manner as claimed by the Applicant and as viewed in light of the Applicant's specification and figures.

More specifically, the Applicant respectfully believes that Agazzi fails to teach and disclose each and every limitation of the subject matter as claimed by the Applicant in the claims rejected as being anticipated by Agazzi.

As such, the Applicant respectfully requests that the Examiner withdraw the rejection of claims 1, 2, 4, 7, 8, 17-20, 28, 31, 34-36, 40, 42, 45-47, 50, 51, 60, 61, 63, and 64 under 35 U.S.C. §102(e) as being anticipated by Agazzi.

35 U.S.C. §103(a)

5. The Examiner rejected claims 15, 16, 32, 33, 43, 44, 58, 59, 68, and 69 under 35 U.S.C. §103(a) as being unpatentable over Agazzi and in further view of Fulgham.

The Applicant respectfully traverses.

The Applicant respectfully points out that the combination of Fulgham with Agazzi fails to overcome the deficiencies of Agazzi with respect to independent claims 1, 17, 34, 45, and 60, which the Applicant respectfully believes are allowable in view of the comments made above.

The Applicant respectfully believes that claims 15-16, being further limitations on the subject matter of claim 1, are also allowable.

The Applicant respectfully believes that claims 32-33, being further limitations on the subject matter of claim 17, are also allowable.

The Applicant respectfully believes that claims 43-44, being further limitations on the subject matter of claim 34, are also allowable.

The Applicant respectfully believes that claims 58-59, being further limitations on the subject matter of claim 45, are also allowable.

The Applicant respectfully believes that claims 68-69, being further limitations on the subject matter of claim 60, are also allowable.

As such, the Applicant respectfully requests that the Examiner withdraw the rejection of claims 15, 16, 32, 33, 43, 44, 58, 59, 68, and 69 under 35 U.S.C. §103(a) as being unpatentable over Agazzi and in further view of Fulgham.

Allowable Subject Matter

6. The Examiner has indicated that claims 3, 5, 6, 9-14, 21-27, 29, 30, 37-39, 41, 48, 49, 52-57, 62, and 65-67 are objected to as being dependent upon a rejected base claims, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The Applicant respectfully believes that independent claims 1, 17, 34, 45, and 60, which the Applicant respectfully believes are allowable in view of the comments made above.

The Applicant respectfully believes that each of the claims 3, 5, 6, 9-14, 21-27, 29, 30, 37-39, 41, 48, 49, 52-57, 62, and 65-67 is also allowable, being a further limitation on what the Applicant respectfully believes to be an allowable independent claim on which each of them respectively depends either directly or interveningly.

As such, the Applicant respectfully requests that the Examiner withdraw the objection to claims 3, 5, 6, 9-14, 21-27, 29, 30, 37-39, 41, 48, 49, 52-57, 62, and 65-67.

The Applicant respectfully believes that claims 1-69 are in condition for allowance and respectfully requests that they be passed to allowance.

The Examiner is invited to contact the undersigned by telephone or facsimile if the Examiner believes that such a communication would advance the prosecution of the present patent application.

RESPECTFULLY SUBMITTED,

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